

REMARKS

Reconsideration of the election requirement is again requested. The examiner has made no showing that the claims are independent and distinct, which is required before an election or restriction is proper. Applicants again assert that the examiner has not provided any authority for any "long understood" interpretation of "and" as "or", and such is contrary to the plain language of the statute. The undersigned again requests that the examiner provide appropriate judicial support that the term "and" may be interpreted as "or". It is further requested that the election requirement be withdrawn. In the alternative it is submitted that all of claims 1-8, 11-12, 15-16 and 19-20 be considered to be within the elected species and claim grouping.

The drawings have been objected to under 37 CFR 1.83 (a). It is again submitted that this objection is not well taken and should be withdrawn, because the nature of the subject matter sought to be patented DOES NOT admit of illustration by drawings, and drawings are NOT necessary for the understanding of the subject matter (see 37 C.F.R. 1.81(a),(c)).

The claims pertain to a series of layers which are easily understandable and hence no drawing figures should be required in this case at all. Solely as a convenience, the Applicant has provided thirty-two (32) reference figures to even further ease understanding of the invention. Rather than the case of a complex mechanical device where drawing figures are truly required, this application provided superfluous figures which merely show the flow of layer application. Drawing figure 10 shows the structure of claim 23 where the substrate may be considered the lowermost edge of the organic low-k dielectric. The balance of the claims 24-

31 merely represent a series of repetitions of the shown layers. Additionally, the sufficiency of these drawing figures has already been accepted by the United States Patent and Trademark Office by the granting of the parent application as U.S. 6,287,955. It is therefore submitted that the drawing figures already show every feature of the invention specified in the claims such that they would be well understood by the skilled artisan. Should the examiner continue to maintain the objection, it is submitted that the bottom solid black line of each of the illustrated structures effectively exemplifies a substrate upon which the individual layers are deposited. It is therefore requested that the objection to the drawings be withdrawn. In the alternative, it is requested that the objection to the drawing figures be held in abeyance until patentable subject matter is indicated.

Claims 23-31 have been rejected under 35 U.S.C. 102(e) over U.S. patent 6,071,809 to Zhao. It is respectfully submitted that the rejection has been overcome by the instant amendment. Applicants have amended the claims to clarify that the first dielectric layer is located *on a surface of the substrate*. Support for this amendment can be found in the figures and in the specification at page 17, lines 3-10 and in the description of the figures. Claims 23 and 29 have also been amended to specify that the hydrogensiloxanes have the formula $[(\text{HSiO}_{1.5})_x\text{O}_y]_n$, and the hydrogensilsesquioxanes have the formula $(\text{HSiO}_{1.5})_n$, wherein x = about 6 to about 20, y = 1 to about 3, and n = 1 to about 4,000.

The invention claims an integrated circuit structure which comprises a substrate and (a) an organic layer *on a surface of the substrate* which comprises a pattern of metal lines on the substrate and an organic dielectric on the substrate *surface* between the metal lines; and (b) an inorganic layer on the organic layer which comprises an inorganic dielectric selected from the group consisting of

hydrogensiloxanes, inorganic hydrogensilsesquioxanes and combinations thereof, having metal filled vias therethrough which connect to the metal lines of the organic layer; and wherein the hydrogensiloxanes have the formula $[(\text{HSiO}_{1.5})_x\text{O}_y]_n$, and the hydrogensilsesquioxanes have the formula $(\text{HSiO}_{1.5})_n$, wherein x = about 6 to about 20, y =1 to about 3, and n =1 to about 4,000.

Also claimed is a dielectric coated substrate which comprises: (a) a first dielectric composition film *on a surface of a substrate*; and (b) a second dielectric composition film on the first dielectric composition film; wherein the first dielectric composition and the second dielectric composition have substantially different etch resistance; wherein either the first dielectric composition film is organic and the second dielectric composition film is inorganic; or the first dielectric composition film is inorganic and the second dielectric composition film is organic; and wherein the inorganic dielectric composition film comprises an inorganic dielectric selected from the group consisting of hydrogensiloxanes, inorganic hydrogensilsesquioxanes and combinations thereof; and wherein the hydrogensiloxanes have the formula $[(\text{HSiO}_{1.5})_x\text{O}_y]_n$, and the hydrogensilsesquioxanes have the formula $(\text{HSiO}_{1.5})_n$, wherein x = about 6 to about 20, y =1 to about 3, and n =1 to about 4,000.

Zhao does not teach or describe structures having either of these embodiments. Zhao teaches a patterned and etched silicon dioxide or low-k dielectric on a substrate that is filled with metal to form contacts. A cap layer is then formed on the metal and dielectric material. The cap layer may be a silicon nitride or silicon dioxide. In comparing the structure of Zhao and Applicants' structure, it may be assumed that layer 306 on the substrate 302 of Zhao is analogous to Applicants' first dielectric layer on the substrate, and that the cap layer 308 of Zhao is

analogous to Applicants' second dielectric layer. When this comparison is made, the Zhao structure is not the same as that taught by Applicants. Particularly, Zhao's cap layer 308 is not an inorganic material selected from the group consisting of hydrogensiloxanes, inorganic hydrogensilsesquioxanes and combinations thereof wherein the hydrogensiloxanes have the formula $[(\text{HSiO}_{1.5})_x\text{O}_y]_n$, and the hydrogensilsesquioxanes have the formula $(\text{HSiO}_{1.5})_n$, wherein x = about 6 to about 20, y =1 to about 3, and n =1 to about 4,000. Rather, cap layer 308 is only described as a silicon nitride layer or a silicon dioxide. This is an important and distinguishing limitation of the claimed invention that is not described by the applied reference.

The examiner contends that Zhao describes a structure wherein layer 316 represents an organic layer on a substrate and between the metal lines and wherein layer 310 represents an inorganic layer of Applicants' materials on the organic layer. Applicants' respectfully submit that such is incorrect. Layer 316 of Zhao is not located on a surface of the substrate. In contrast, Applicants' amended claims now clarify that the first dielectric layer is located on the substrate surface.

Furthermore, Zhao et al. do not teach an organic layer on a surface of the substrate and an inorganic layer on the organic layer which inorganic layer comprises a dielectric selected from the group consisting of hydrogensiloxanes, inorganic hydrogensilsesquioxanes and combinations thereof, wherein the hydrogensiloxanes have the formula $[(\text{HSiO}_{1.5})_x\text{O}_y]_n$, and the hydrogensilsesquioxanes have the formula $(\text{HSiO}_{1.5})_n$, wherein x = about 6 to about 20, y =1 to about 3, and n =1 to about 4,000.

Even should one consider Zhao cap layer 318 as analogous to Applicants' substrate, the applied reference still fails to teach the claimed invention.

Particularly, while Zhao layer 316 is described as a low-k dielectric layer which may comprise an organic material, Zhao et al. does not describe that next layer 312 may comprise an inorganic dielectric selected from the group consisting of hydrogensiloxanes, inorganic hydrogensilsesquioxanes and combinations thereof having the formulas described above. Rather, layer 312 is described solely as materials such as silicon dioxide, silicon oxynitride, aluminum oxide, silicon carbide and the like. Additionally, layer 312 is NOT described as a material formed of the same dielectric materials used to form low-k dielectrics 310 or 316. In fact, the list of materials suitable for forming layer 312 include some very different materials than those used to describe the other specified low dielectric constant materials by Zhao. This further emphasizes the fact that layer 312 is not described or suggested as comprising either hydrogensiloxanes or hydrogensilsesquioxanes having said criteria.

It is further submitted that Zhao et al. do not teach or describe an embodiment in which an inorganic dielectric composition is positioned on a substrate, and an organic dielectric composition on the inorganic dielectric composition, wherein the first dielectric composition and the second dielectric composition have substantially different etch resistance; and wherein the inorganic dielectric composition film comprises an inorganic dielectric selected from the group consisting of hydrogensiloxanes, inorganic hydrogensilsesquioxanes and combinations thereof and wherein the hydrogensiloxanes have the formula $[(\text{HSiO}_{1.5})_x\text{O}_y]_n$, and the hydrogensilsesquioxanes have the formula $(\text{HSiO}_{1.5})_n$, wherein x = about 6 to about 20, y =1 to about 3, and n =1 to about 4,000.

It is respectfully asserted that the claimed invention is significantly different than the structures described in Zhao et al. For these collective reasons it is submitted that the rejection is improper and should be withdrawn.

Claims 23-33 have been rejected under 35 U.S.C. 102(e) over U.S. patent 6,207,555 to Ross. It is respectfully submitted that the rejection has been overcome by the instant amendment. Ross does not teach or describe a structure wherein an organic dielectric layer is on a surface of a substrate between metal contact lines, and having an inorganic dielectric layer on the organic layer which inorganic layer comprises a dielectric selected from the group consisting of hydrogensiloxanes, inorganic hydrogensilsesquioxanes and combinations thereof and wherein the hydrogensiloxanes have the formula $[(\text{HSiO}_{1.5})_x\text{O}_y]_n$, and the hydrogensilsesquioxanes have the formula $(\text{HSiO}_{1.5})_n$, wherein x — about 6 to about 20, $y=1$ to about 3, and $n=1$ to about 4,000.

To be sure, Ross does describe a structure having a multiple dielectric layers which may comprise any of a wide variety of inorganic or organic materials. However, such a broad disclosure does not specifically describe the invention claimed by Applicants. More particularly, the broad disclosure of Ross does not describe a structure which comprises an organic layer *on a surface of a substrate* which comprises a pattern of metal lines on the substrate and an organic dielectric on the substrate *surface* between the metal lines; and an inorganic layer on the organic layer which comprises an inorganic dielectric selected from the group consisting of hydrogensiloxanes, inorganic hydrogensilsesquioxanes and combinations thereof, having metal filled vias therethrough which connect to the metal lines of the organic layer. Nor does Ross describe a structure having a first dielectric composition film *on a surface of a substrate*; and a second dielectric

composition film on the first dielectric composition film; wherein the first dielectric composition and the second dielectric composition have substantially different etch resistance; wherein when the first dielectric composition film is organic then the second dielectric composition film is inorganic; or when the first dielectric composition film is inorganic then the second dielectric composition film is organic; and wherein the inorganic dielectric composition film comprises an inorganic dielectric selected from the group consisting of hydrogensiloxanes, inorganic hydrogensilsesquioxanes and combinations thereof and wherein the hydrogensiloxanes have the formula $[(\text{HSiO}_{1.5})_x\text{O}_y]_n$, and the hydrogensilsesquioxanes have the formula $(\text{HSiO}_{1.5})_n$, wherein x = about 6 to about 20, y =1 to about 3, and n =1 to about 4,000.

The examiner states that layer 4 of Ross is an organic layer between metal lines, and that layers 14, 26 and 28 are inorganic layers on the organic layer. Applicants respectfully assert that Ross does not describe with particularity such an embodiment. Rather, Ross teaches that each of their dielectric layers may comprise any of a variety of materials. Additionally, while Ross does mention that it is preferred that the first and second dielectric layers be different than each other, this does not necessarily indicate that one dielectric layer must be organic while the other layer is inorganic. Indeed, their first and second dielectric layers may comprise two different inorganic materials, or two different organic materials. Therefore, it is respectfully asserted that Ross fails to teach or describe the claimed invention. For these reasons, it is requested that the rejection be withdrawn.

Claims 23-33 have been rejected under 35 U.S.C. 103 over Zhao et al. It is respectfully asserted that the rejection has been overcome by the instant

amendment. Zhao does not teach or suggest a structure as claimed by Applicants wherein the hydrogensiloxanes have the formula $[(\text{HSiO}_{1.5})_x\text{O}_y]_n$, and the hydrogensilsesquioxanes have the formula $(\text{HSiO}_{1.5})_n$, wherein x = about 6 to about 20, y =1 to about 3, and n =1 to about 4,000.

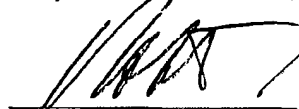
The arguments from above regarding Zhao are repeated herein. There is no teaching or suggestion in Zhao which indicates the formation of a structure in which an organic dielectric is on a surface of a substrate in between metal contact lines, and having an inorganic dielectric material on the organic dielectric which inorganic material comprises a material selected from hydrogensiloxanes, inorganic hydrogensilsesquioxanes and combinations thereof and wherein the hydrogensiloxanes have the formula $[(\text{HSiO}_{1.5})_x\text{O}_y]_n$, and the hydrogensilsesquioxanes have the formula $(\text{HSiO}_{1.5})_n$, wherein x = about 6 to about 20, y =1 to about 3, and n =1 to about 4,000.

The examiner states that it would be obvious to one skilled in the art to form an inorganic dielectric layer having a composition as described above. It is respectfully submitted that such is incorrect. While Zhao does disclose that their dielectric layer 310 may comprise an inorganic low-k material, including silsesquioxane, there is nothing in the applied reference to teach or suggest that the silsesquioxane may comprise a *hydrogensilsesquioxane*, much less a layer that may comprise a hydrogensilsesquioxane having the formula $(\text{HSiO}_{1.5})_n$, wherein x = about 6 to about 20, y =1 to about 3, and n =1 to about 4,000 or a hydrogensiloxane having the formula $[(\text{HSiO}_{1.5})_x\text{O}_y]_n$. Moreover, as discussed above, Zhao only describes their cap layer on the organic dielectric layer as comprising either silicon nitride or silicon dioxide. There is no teaching or suggestion that this cap layer may even comprise a silsesquioxane, much less a

hydrogensilsesquioxane or a *hydrogensiloxanes*, or more particularly a *hydrogensilsesquioxane* having the formula $(\text{HSiO}_{1.5})_n$, wherein x = about 6 to about 20, y =1 to about 3, and n =1 to about 4,000 or a *hydrogensiloxane* having the formula $[(\text{HSiO}_{1.5})_x\text{O}_y]_n$. For these reasons it is urged that the claimed invention is not obvious in view of the applied art, and it is requested that the rejection be withdrawn.

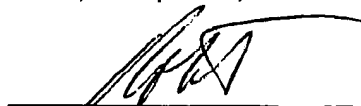
The undersigned respectfully requests re-examination of this application and believes it is now in condition for allowance. Such action is requested. If the examiner believes there is any matter which prevents allowance of the present application, it is requested that the undersigned be contacted to arrange for an interview which may expedite prosecution.

Respectfully submitted,



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I hereby certify that this paper is being facsimile transmitted to the Patent and Trademark Office (FAX No. 703-308-7722) on April 23, 2002.



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MARKED COPY OF AMENDED CLAIMS

23. (Twice Amended) An integrated circuit structure which comprises a substrate and

(a) an organic layer on a surface of the substrate which comprises a pattern of metal lines on the substrate and an organic dielectric on the substrate surface between the metal lines; and

(b) an inorganic layer on the organic layer which comprises an inorganic dielectric selected from the group consisting of hydrogensiloxanes, inorganic hydrogensilsesquioxanes and combinations thereof, having metal filled vias therethrough which connect to the metal lines of the organic layer; and wherein the hydrogensiloxanes have the formula $[(\text{HSiO}_{1.5})_x\text{O}_y]_n$, and the hydrogensilsesquioxanes have the formula $(\text{HSiO}_{1.5})_n$, wherein x = about 6 to about 20, y =1 to about 3, and n =1 to about 4,000.

29. (Twice Amended) A dielectric coated substrate which comprises:

(a) a first dielectric composition film on a surface of a substrate; and

(b) a second dielectric composition film on the first dielectric composition film; wherein the first dielectric composition and the second dielectric composition have substantially different etch resistance; wherein either the first dielectric composition film is organic and the second dielectric composition film is inorganic; or the first dielectric composition film is inorganic and the second dielectric composition film is organic; and wherein the inorganic dielectric composition film comprises an inorganic dielectric selected from the group consisting of hydrogensiloxanes, inorganic hydrogensilsesquioxanes and combinations thereof; and wherein the hydrogensiloxanes have the formula

$[(11\text{SiO}_{1.5})_x\text{O}_y]_n$ and the hydrogensilsesquioxanes have the formula $(\text{HSiO}_{1.5})_n$,
wherein x = about 6 to about 20, y =1 to about 3, and n =1 to about 4,000.